

WHAT IS CLAIMED IS:

- 1 1. A sensor card, comprising:
2 one or more sensors to respectively collect sensor data;
3 a memory;
4 sensor interface circuitry coupled to the one or more sensors to receive the
5 sensor data and to store the sensor data in the memory; and
6 a digital interface configured for connection to a corresponding digital
7 interface on a mobile communication device, to facilitate access to the memory by a host
8 process operating on the mobile communication device when the sensor card is connected
9 to the mobile communication device via the digital interface.
- 1 2. The sensor card as in Claim 1, wherein the sensor interface circuitry further
2 comprises a bridge coupled between the one or more sensors and an external memory also
3 implementing the digital interface to facilitate mapping of the sensor data into a defined
4 portion of the external memory, wherein the host process receives the sensor data via the
5 defined portion of the external memory.
- 1 3. The sensor card as in Claim 2, wherein the bridge comprises means for
2 switching between the defined portion of the external memory and remaining portions of
3 the external memory to allow the host process to access the sensor data and other non-
4 sensor data respectively.
- 1 4. The sensor card as in Claim 1, further comprising a housing to house the
2 sensor card when the sensor card is not connected to the mobile communication device,
3 wherein the housing comprises a power source to provide power to the sensor card to allow
4 the sensor data to be stored in the memory when the sensor card is housed within the
5 housing.
- 1 5. The sensor card as in Claim 1, further comprising a substrate housing the
2 one or more sensor elements, the memory, and the sensor interface circuitry.

1 6. The sensor card as in Claim 5, further comprising a housing to encapsulate
2 the substrate.

1 7. The sensor card as in Claim 1, wherein the sensor interface circuitry
2 comprises a memory controller coupled to the digital interface, wherein the memory
3 controller is configured to enable access to the memory by both the sensor interface
4 circuitry and the host process.

1 8. The sensor card as in Claim 7, wherein the memory controller comprises a
2 direct memory access (DMA) controller to facilitate DMA transfers from the sensor
3 interface circuitry to the memory.

1 9. The sensor card as in Claim 1, wherein the digital interface comprises a
2 short range wireless interface for wirelessly coupling the memory and sensor data to the
3 host process operating on the mobile communication device.

1 10. The sensor card as in Claim 9, wherein the short range wireless interface
2 comprises any of a Bluetooth interface and an infrared (IR) interface.

1 11. The sensor card as in Claim 9, wherein the short range wireless interface is
2 further wirelessly coupled to one or more radio frequency (RF)-enabled sensor devices to
3 receive respective sensor data from the RF-enabled sensor devices.

1 12. The sensor card as in Claim 1, wherein the digital interface comprises at
2 least one of a serial interface, an MMC interface, a Serial Peripheral Interface (SPI), RS-
3 232 interface, I²C interface, and Universal Serial Bus (USB) interface.

1 13. The sensor card as in Claim 1, wherein the sensor interface circuitry
2 comprises means for conditioning the sensor data for storing in the memory.

1 14. The sensor card as in Claim 1, wherein the sensor interface circuitry
2 comprises an interface module coupled to the one or more sensors to receive analog sensor
3 data and to provide digital representations of the analog sensor data.

1 15. The sensor card as in Claim 1, wherein the memory comprises non-volatile
2 memory.

1 16. A method for incorporating sensor functionality into mobile communication
2 devices having a host process and employing at least one removable memory card,
3 comprising:
4 facilitating access to the removable memory card by the host process using
5 a digital interface;
6 storing sensor data from one or more sensor modules into a memory;
7 coupling the host process of the mobile communication device to the
8 memory via the digital interface which is used by the host process to access the removable
9 memory card; and
10 accessing the sensor data from the memory by the host process via the
11 digital interface.

1 17. The method of Claim 16, wherein storing sensor data comprises storing
2 sensor data into at least a first portion of the memory, and wherein accessing the sensor
3 data from the memory comprises accessing the sensor data from at least the first portion of
4 the memory.

1 18. The method of Claim 16, wherein storing sensor data comprises mapping
2 sensor data from the memory into a defined portion of the removable memory card, and
3 wherein accessing the sensor data from the memory by the host process comprises
4 accessing the sensor data from the defined portion of the removable memory card.

1 19. The method of Claim 18, wherein mapping sensor data from the memory
2 into a defined portion of the removable memory card comprises enabling a bridge to

3 deliver the sensor data from sensor registers to the defined portion of the removable
4 memory card.

1 20. The method of Claim 19, wherein accessing the sensor data from the
2 memory comprises enabling the bridge to deliver the sensor data from the defined portion
3 of the removable memory card to the host process.

1 21. The method of Claim 19, further comprising disabling the bridge to
2 facilitate non-sensor-related memory transactions with the removable memory card from
3 address locations not within the defined portion of the removable memory card.

1 22. The method of Claim 16, further comprising removably coupling the one or
2 more sensor modules and the memory to the mobile communication device.

1 23. The method of Claim 22, wherein removably coupling the one or more
2 sensor modules and the memory to the mobile communication device comprises
3 connecting the one or more sensor modules and the memory to one or more connector slots
4 on the mobile communication device.

1 24. The method of Claim 16, further comprising disconnecting the host process
2 of the mobile communication device from the memory, and storing the sensor data from
3 the one or more sensor modules into the memory when the one or more sensor modules
4 and the memory are disconnected from the host process of the mobile communication
5 device.

1 25. The method of Claim 16, wherein storing sensor data from one or more
2 sensor modules into the memory comprises storing at least some of the sensor data from
3 one or more sensor modules into the memory before coupling the host process of the
4 mobile communication device to the memory.

1 26. The method of Claim 16, wherein storing sensor data from one or more
2 sensor modules into the memory comprises storing at least some of the sensor data from

3 one or more sensor modules into the memory after coupling the host process of the mobile
4 communication device to the memory.

1 27. The method of Claim 16, wherein the removable memory card comprises a
2 MultiMedia card (MMC), and wherein the digital interface comprises an MMC interface.

1 28. The method of Claim 16, wherein the digital interface comprises any of an
2 MMC interface, Serial Peripheral Interface (SPI), RS-232 interface, I²C interface, and
3 Universal Serial Bus (USB) interface.

1 29. The method of Claim 16, wherein storing sensor data from one or more
2 sensor modules into a memory comprises performing direct memory access (DMA)
3 transfers of the sensor data to the memory.

1 30. A system for providing sensor functionality to mobile devices capable of
2 communicating over a mobile communications network, the system comprising:
3 modular sensor functionality comprising one or more sensors for gathering
4 sensor data and a sensor memory to store the sensor data;
5 a modular memory;
6 a mobile communication device comprising a master process for controlling
7 communication between the master process and one or both of the modular sensor
8 functionality and the module memory; and
9 a digital interface for facilitating communication over a bus between the
10 master process and the modular sensor functionality, and between the master process and
11 the modular memory.

1 31. The system as in Claim 30, wherein the mobile communication device
2 comprises a processor for executing the master process, and wherein the processor
3 executing the master process is configured to access the sensor data from the sensor
4 memory via the digital interface.

1 32. The system as in Claim 30, wherein the mobile communication device
2 comprises a processor for executing the master process, and wherein the processor
3 executing the master process is configured to access the modular memory via the digital
4 interface.

1 33. The system as in Claim 30, wherein the modular sensor functionality
2 comprises a sensor interface coupled to the one or more sensors and to the modular
3 memory to facilitate storing of the sensor data in the modular memory via the digital
4 interface.

1 34. The system as in Claim 33, wherein the mobile communication device
2 comprises a processor for executing the master process, and wherein the processor
3 executing the master process is configured to access the sensor data from the modular
4 memory via the digital interface.

1 35. The system as in Claim 34, further comprising a bridge coupled between the
2 processor for executing the master process and the modular memory to manage memory
3 accesses to and from the module memory by the master process and the modular sensor
4 functionality.

1 36. The system as in Claim 30, wherein host process is detached from the
2 sensor functionality, and wherein the modular sensor functionality operates in a stand-
3 alone mode to write the sensor data to the modular memory for subsequent retrieval by the
4 mobile communication device when the mobile communication device is re-attached to the
5 sensor functionality.

1 37. The system as in Claim 30, wherein the digital interface comprises a
2 MultiMedia Card (MMC) interface, and wherein the modular memory comprises an
3 MMC-compliant memory card.

1 38. The system as in Claim 30, wherein the host process comprises a mobile
2 phone engine operable to control communications over a cellular network.

1 39. A mobile device having a scalable sensor system and capable of
2 communicating wirelessly over a mobile communications network, the mobile device
3 comprising:
4 a processor configured to execute a host process;
5 at least one modular card having sensor functionality implemented thereon
6 to gather sensor data;
7 one or more slots for receiving the modular cards; and
8 a scalable digital interface to couple the sensor functionality of the modular
9 cards to the host process operating on the mobile device.

1 40. The mobile device as in Claim 39, further comprising a memory coupled to
2 the scalable digital interface, and wherein the modular card having sensor functionality
3 implemented thereon further comprises a bridge coupled between the sensor functionality
4 and the memory to facilitate mapping of the sensor data into a defined portion of the
5 memory, wherein the host process receives the sensor data via the defined portion of the
6 memory.

1 41. The mobile device as in Claim 39, wherein mobile device comprises a
2 mobile phone or a personal digital assistant (PDA).